

REMARKS

Claims 1-19 are currently pending in the subject application. Claim 1 is the only independent claim.

A. Introduction

In the outstanding Office Action Made Final, the Examiner rejected claims 1-2, 6, 9-15, and 18 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,062,681 to Field et al. ("the Field et al. reference"); rejected claims 3-5 and 7-8 under 35 U.S.C. § 103(a) as being unpatentable over the Field et al. reference in view of U.S. Patent No. 5,751,317 to Peeters et al. ("the Peeters et al. reference"); and rejected claim 16-17 and 19 under 35 U.S.C. § 103(a) as being unpatentable over the Field et al. reference.

B. Asserted Anticipation Rejection of Claims 1-2, 6, 9-15, and 18

In the outstanding Office Action Made Final, the Examiner rejected claims 1-2, 6, 9-15 and 18 under 35 U.S.C. § 102(b) as being anticipated by the Field et al. reference. Applicants respectfully traverse this rejection, and respectfully submit that the Examiner has failed to set forth a *prima facie* case of anticipation for at least the reasons set forth below.

Independent claim 1 recites, *inter alia*,

A micro-pump comprising:
a pumping chamber to be filled with a fluid;
at least one fluid entrance and at least one fluid exit, which are connected to the pumping chamber ...
wherein a *fluid flow into or out of the pumping chamber is by expansion and contraction of the bubbles*, and wherein a *cross-sectional area of at least one of the fluid entrance and the fluid exit varies along a direction of the fluid flow*.

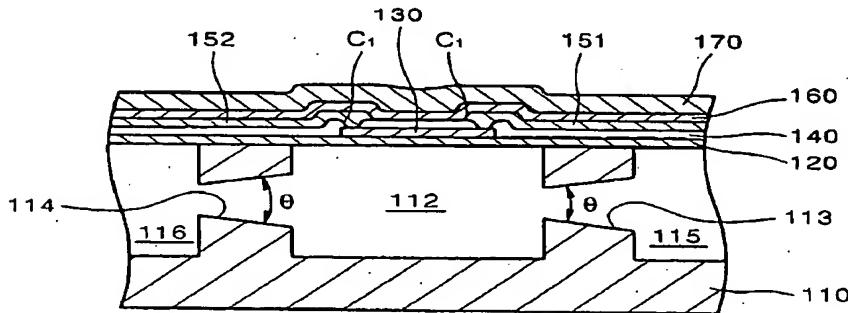
In other words, claim 1 is directed, *inter alia*, toward a pumping chamber with an inlet and an outlet for a fluid, so that *bubble expansion/contraction can move the fluid* in/out of the pumping chamber, at least one of the *inlet/outlet having a varied cross-sectional area*. The Field et al. reference, on the other hand, neither teaches nor even remotely suggests (1)

an inlet or an outlet portion of a pumping chamber that has a varied cross sectional area, **and**
(2) a fluid flow mechanism operated via bubble expansion/contraction.

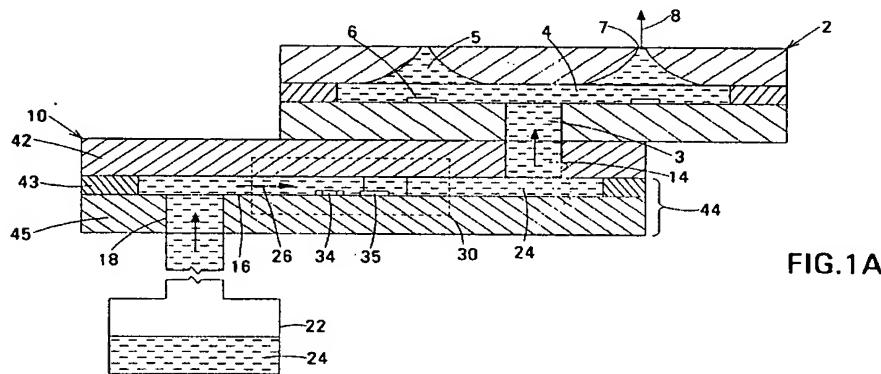
(a) Lack of anticipation of an inlet/outlet with a varied cross sectional area

As shown in FIG. 4B of the present application reproduced below, the pumping chamber 112 has a fluid entrance 113 and a fluid exit 114, the cross sectional area of at least one of the fluid entrance 113 and/or of the fluid exit 114 is irregularly shaped. In this respect, it is noted that each one of the pumping chamber 112, fluid entrance 113, and fluid exit 114 is a *single* discrete element.

FIG. 4B



The Field et al. reference, on the other hand, teaches an ink channel 16 with inlet/outlet portions 18 and 14 having *rectangular cross-sectional areas*, i.e., uniform cross-sectional areas, as illustrated in FIG. 1A of the Field et al. reference and as reproduced below.



With respect to the Examiner's assertion that the outlet 14, manifold 4, and manifold outlet 5 in FIG. 1A of the Field et al. reference are in fluid communication with one another and have different cross sectional areas, and therefore, are considered as anticipating the fluid exit 114 as recited in claim 1, applicants respectfully submit that such an interpretation of the language of claim 1 is improper because it is unreasonably broad. Further, applicants note that such an interpretation is inconsistent with the remainder of the Examiner's arguments.

(1) Unreasonably broad interpretation of the term "fluid exit"

It is well settled law that the Examiner must construe applicants' claims in view of the application as a whole from the perspective of *a person of ordinary skill in the art*.¹ However, applicants respectfully submit the Examiner's interpretation of the term "fluid exit connected to a pumping chamber" as recited in claim 1 to include a fluid path through (1) a pumping outlet, (2) an ink manifold inlet, (3) an ink manifold, (4) an ink manifold outlet, and (5) an manifold outlet leading to a sheet of paper *does not comport* with the meaning that the term "fluid exit connected to a pumping chamber" would be accorded by one of ordinary skill in the art.

In particular, even though the ink outlet 14, manifold inlet 3, manifold 4, manifold outlet 5, and orifice 8 of the Field et al. reference are in fluid communication with each other, they are *separate elements of two different parts of the printer*. More specifically, the ink outlet 14 is a portion of the pressure regulator 10, while the manifold 4 with its inlet/outlet portions is a part of the print head 2, i.e., a separate element. *Field et al. reference*, col. 8, lines 5-25. In fact, the "pressure regulator and the print head are shown as separate components [in FIG. 1A]," *id*, and the "ink outlet 14" of the pressure regulator 10 and "manifold 4" of the print head 2 provide different functions, thereby clearly indicating that one of ordinary skill in the art would not consider the ink outlet 14, manifold inlet 3,

¹ *In re Morris*, 127 F.3d 1048, 1054, 44 USPQ2d 1023 (Fed. Cir. 1997).

manifold 4, and manifold outlet 5 as a single fluid exit from the pumping chamber, i.e., ink channel 16/bubble valve 30.

In fact, with the exception of asserting that the ink outlet 14, manifold 4, and manifold outlet 5 collectively anticipate the fluid exit recited in claim 1, *Office actions of July 18, 2007, page 2, lines 9-11 of ¶ 4*, the Examiner himself refers solely to the “ink outlet 14” as the fluid exit in supporting alleged anticipation of other claims in the *Office action of July 18, 2007*. For example, the Examiner refers to the “fluid exit 14” as provided “at an opposite side of the pumping chamber 130 to face the fluid entrance,” *id., page 3, lines 5-7*, and to “a substrate 45 surrounding portions of the pumping chamber 130, the fluid entrance 18, and the “fluid exit 14,” *id., page 3, lines 11-12*, in supporting an alleged anticipation of claims 6 and 12.

Accordingly, applicants respectfully reiterate that a person of ordinary skill in the art would not have understood the term “fluid exit connected to a pumping chamber” to include the ink manifold and portions thereof, and therefore, the Examiner’s interpretation of the term “fluid exit” is unreasonably broad. Therefore, the Field et al. reference fails to anticipate an inlet or an outlet portion of a pumping chamber that has a varied cross sectional area.

(2) Inconsistent interpretation of the term “fluid exit”

As an additional matter, applicants note that the Examiner refers to the “fluid exit” inconsistently. In particular, in supporting alleged anticipation of claim 1, the Examiner asserts that the “fluid exit” is represented collectively by the “outlet 14”, “manifold 4”, and “manifold outlet 5.” *Office action of July 18, 2007, page 2, lines 9-11 of ¶ 4*. In supporting alleged anticipation of claim 2, the Examiner asserts that the “fluid exit” is represented solely by the “manifold outlet 5,” i.e., an increased cross-sectional area toward the pumping chamber. *Id., page 3, line 2*. Finally, in supporting alleged anticipation of claims 6 and 12,

the Examiner asserts that the “fluid exit” is represented by the “outlet 14.” *Id.*, page 3, lines 5-7; 11-12.

Applicants respectfully submit that the “outlet 14” has a rectangular configuration, the “manifold outlet 5” has a triangular configuration, and the collective structure of the “outlet 14”, “manifold 4”, and “manifold outlet 5” exhibits a configuration having a cross-sectional area that narrows and widens alternately. In other words, each of the elements used by the Examiner to represent the “fluid exit” recited in claim 1 has a different cross sectional configuration. Applicants respectfully submit that the “fluid exit” recited in claim 1 can be represented at most by a single element (or a single collection of elements) having a predetermined configuration. The “fluid exit” recited in claim 1 *cannot* be anticipated by a plurality of elements having different cross-sectional areas.

(b) Lack of anticipation of a fluid flow mechanism operated via bubble expansion/contraction

As shown in FIGS. 5A-5B of the present application reproduced below, the heating element 130 forms a bubble 190. Expansion of the bubble 190 *pushes* fluid out of the pumping chamber 120, while contraction of the bubble 190 pulls fluid back into the pumping chamber 112. In other words, the pumping chamber 112 is *physically* configured, such that bubble expansion/contraction forms *sufficient pressure gradient* to affect fluid flow in/out of the pumping chamber 112. The Field et al. reference, on the other hand, does not teach a similar fluid flow control via modification of a pressure gradient.

FIG. 5A

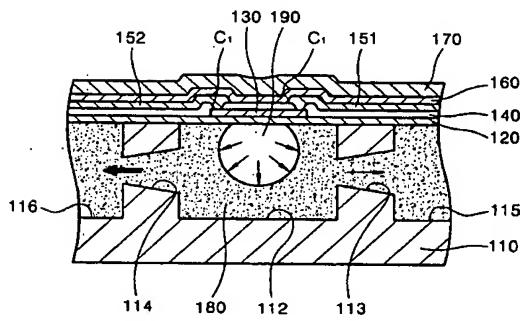
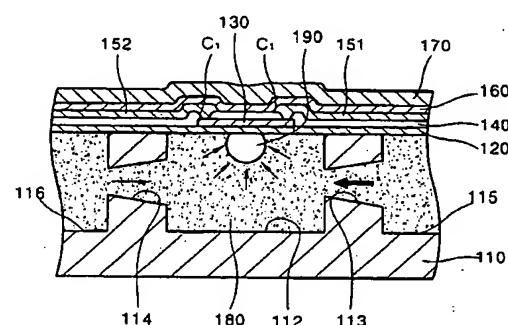


FIG. 5B



The Field et al. reference teaches flow in/out through a bubble valve 130 by sealing/unsealing a constriction 132 in the ink channel 116 with a bubble 39 via a dual heater system. *Field et al. reference*, col. 14, lines 27-49. More specifically, the Field et al. reference teaches use of a temperature gradient to move a bubble from one heater to another to facilitate sealing/unsealing of the constriction 132, thereby affecting fluid flow through the constriction 132. *Id.* It is noted that the bubble's size does not necessarily change whether it is at the first or second heater 134 and 135, i.e., sealing/unsealing the constriction 132. As such, the formation and/or the mere presence of the bubble 39 in the ink channel 116 forms a negligible pressure gradient. Accordingly, the Field et al. reference does not anticipate or even remotely suggest a pumping system having a fluid flow mechanism operated via bubble expansion/contraction.

In view of the above, applicants respectfully submit that the Field et al. reference fails to teach or suggest each and every element of claim 1, and therefore, claim 1 is believed allowable over the cited prior art. Accordingly, applicants respectfully request that the rejection of claim 1 and claims dependent thereon be favorably reconsidered and withdrawn.

C. Asserted Obviousness Rejections of Claims 3-5, 7-8, 16-17, and 19

In the outstanding Office Action Made Final, the Examiner rejected claims 3-5 and 7-8 under 35 U.S.C. § 103(a) as being unpatentable over the Field et al. reference in view of the Peeters et al. reference; and rejected claims 16-17 and 19 under 35 U.S.C. § 103(a) as being unpatentable over the Field et al. reference. Applicants respectfully submit that the cited references fail to teach each and every element of independent claim 1, and therefore, claims 3-5, 7-8, 16-17, and 19 are allowable for at least the reasons set forth above regarding claim 1.

E. Conclusion

The above remarks demonstrate the failings of the Examiner's arguments with respect to the outstanding rejection, and are sufficient to overcome them. However, these remarks are not intended to, nor need they, comprehensively address each and every reason for the patentability of the claimed subject matter over the applied prior art. Accordingly, Applicants *do not* contend that the claims are patentable solely on the basis of the particular claim elements discussed above.

If the Examiner believes that additional discussions or information might advance the prosecution of the instant application, the Examiner is invited to contact the undersigned at the telephone number listed below to expedite resolution of any outstanding issues.

In view of the foregoing amendments and remarks, reconsideration of this application is earnestly solicited, and an early and favorable further action upon all the claims is hereby requested.

Respectfully submitted,

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Date: September 14, 2007


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PETITION and
DEPOSIT ACCOUNT CHARGE AUTHORIZATION

This document and any concurrently filed papers are believed to be timely. Should any extension of the term be required, applicant hereby petitions the Director for such extension and requests that any applicable petition fee be charged to Deposit Account No. 50-1645.

If fee payment is enclosed, this amount is believed to be correct. However, the Director is hereby authorized to charge any deficiency or credit any overpayment to Deposit Account No. 50-1645.

Any additional fee(s) necessary to effect the proper and timely filing of the accompanying-papers may also be charged to Deposit Account No. 50-1645.